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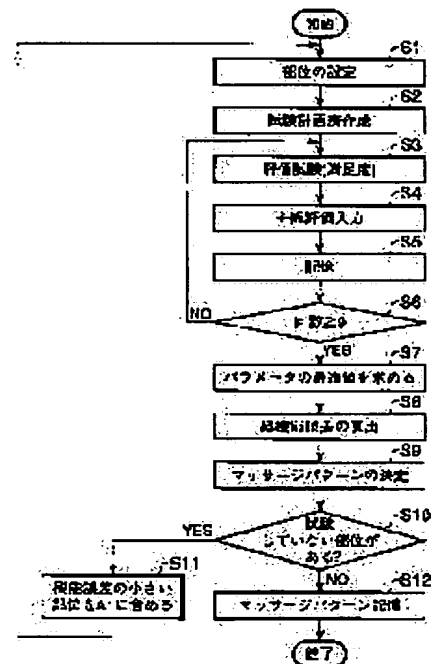
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(54) MASSAGING CONDITION DETERMINING METHOD AND MESSAGE APPARATUS USING THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To determine optimum massaging conditions.

SOLUTION: Three are selected from six parts based on settings at a step S1. A test program list is generated using parameters of the three parts at a step S2. The degree of satisfaction is measured by conducting an evaluation test at a step S3. A user sitting on a massage chair inputs the result of his subjective evaluation using an operating part at a step S4. The degree of satisfaction calculated and the result of the subjective evaluation are stored into a memory in a conditions determining means at a step S5. The frequency of testing is checked at a step S6, and after the testing is conducted nine times, the optimum massaging conditions are determined from the subjective evaluation and the degree of satisfaction through all examinations at a step S7.



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## CLAIMS

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[Claim(s)]

[Claim 1] The message condition decision approach characterized by evaluating the effectiveness of a message to a user based on the evaluation information into which it was inputted by presumption from a user's physiology index and/, or the user, performing the evaluation trial by the rectangular table which made the evaluation value this evaluated result, and determining the optimal message conditions.

[Claim 2] The message condition decision approach according to claim 1 of carrying out determining the optimal message conditions which choose a part from two or more parameters which define an operating condition, perform the evaluation trial by the rectangular table only using this selected parameter, searched for the optimal message conditions, have incorporated that parameter of the remainder by which post selection was not made one by one, repeat the evaluation trial by the rectangular table, are carrying out, and finally include the whole as the description.

[Claim 3] The effectiveness of a message to a user is evaluated based on the evaluation information into which it was inputted by presumption and the user from a user's physiology index. While performing the evaluation trial by the rectangular table which made the evaluation value this evaluated result and determining the optimal message conditions A difference with the evaluation value of the message effectiveness evaluated based on the evaluation information inputted by the evaluation value and user of the message effectiveness evaluated based on presumption from a user's physiology index is computed. The message condition decision approach characterized by redoing the part to which the evaluation trial by the rectangular table corresponds when this difference is larger than a predetermined value, and determining the optimal message conditions again.

[Claim 4] Claim 1 characterized by choosing suitably other message conditions that a user can recognize the difference between the determined optimal message condition and this message condition thru/or the message condition decision approach of any 1 publication of 3.

[Claim 5] In the message machine which has two or more parameters which define an operating condition A message effectiveness evaluation means to evaluate the effectiveness of a message to the user at the time of using it based on the evaluation information into which it was inputted by presumption and/, or the user from a user's

physiology index, It has a message condition decision means to perform the evaluation trial by the rectangular table by making into an evaluation value the result which this message effectiveness evaluation means evaluated, and to determine the optimal message conditions. The message machine characterized by performing message actuation on the message conditions which said message condition decision means determined.

[Claim 6] A selection means to choose a part of message parameter is established. A message condition decision means 1st means to examine in the evaluation trial by the rectangular table only using the parameter chosen by said selection means, and to search for the optimal message conditions, The message machine according to claim 5 characterized by determining the optimal message conditions which establish the 2nd means which has incorporated the remaining parameters which were not chosen one by one, and repeats the evaluation trial by the rectangular table, and finally include the whole.

[Claim 7] In the message machine which has two or more parameters which define an operating condition A message effectiveness evaluation means to evaluate the effectiveness of a message to the user at the time of using it based on the evaluation information into which it was inputted by presumption and the user from a user's physiology index, A message condition decision means to perform the evaluation trial by the rectangular table by making into an evaluation value the result which this message effectiveness evaluation means evaluated, and to determine the optimal message conditions, It has a physiology mental comparison means to compute a difference with the evaluation value of the message effectiveness evaluated based on the evaluation information inputted by the evaluation value and user of the message effectiveness evaluated based on presumption from a user's physiology index. When the difference which said physiology mental comparison means computed is larger than a predetermined value, said message condition decision means redoes the part to which the evaluation trial by the rectangular table corresponds, and the optimal message conditions are determined again. The message machine characterized by performing message actuation on the optimal message conditions finally determined.

[Claim 8] Claim 5 characterized by establishing a guidance means to tell a user about an experimental advance situation while the message condition decision means is performing the evaluation trial by the rectangular table thru/or the message machine of any 1 publication of 7.

[Claim 9] Claim 5 characterized by performing message actuation on the optimal message conditions which established a storage means to memorize the optimal

massage conditions which the massage condition decision means determined, and were memorized for this storage means thru/or the massage machine of any 1 publication of 8.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

#### [0001]

[Field of the Invention] This invention relates to the massage machine, which used the massage condition decision approach of determining the optimal massage conditions for performing massage actuation, and this decision approach.

#### [0002]

[Description of the Prior Art] There are a thing of the chair mold which has a reclining device, and a thing of the bed mold used after the user has gone to sleep on his back in the massage machine aiming at the therapy and the relaxation effectiveness of stiffness in shoulder etc. From the generating principle of a massage stimulus, it rubs and these massage machines are classified into an Ayr style which pushes or puts the body by a pair or two pairs or more of contraction of a ball type and the air bag installed in the interior of a massage opportunity to which it rubs and a ball operates mechanically according to a crank chain, and the vibes type which stimulates the body by vibration which was made to rotate a motor with an eccentric dead weight, and was obtained. Moreover, the highly efficient product which combined these is also put in practical use.

[0003] Many of these massage machines have the remote control unit for the user itself to determine the massage parameter of the location of a massage stimulus, a class, strength, etc., etc., and a massage machine user can receive a favorite massage now by operating this remote control. Moreover, by the comparatively expensive and highly efficient thing, there is what has possible making the location stimulated by remote control actuation move slightly so that the massage effectiveness may hit a high part and the so-called jar in the body among massage machines. Furthermore, there are some which have the function which massages various parts of the body, such as a neck, and a shoulder, the waist, automatically in the procedure programmed beforehand. This function is called the recommendation course or the automatic course, and has been the massage conditions which many users will sense are pleasant.

[0004] However, the user needed to adjust the location of a massage stimulus each time, the massage machine mentioned above had complicated actuation, and it was troublesome. So, in JP,5-300926,A, the head of the user of a massage machine is made to equip with the band with an electrode for electroencephalogram measurement, and it massages, detecting whether an alpha wave (about 10Hz electroencephalogram) increases among a user's electroencephalograms, the massage conditions to which an alpha wave becomes larger are made into optimum conditions, and the optimal massage condition is made to perform massage actuation.

[0005]

[Problem(s) to be Solved by the Invention] However, the thing of JP,5-300926,A supposes that the peak of an alpha wave is searched for among electroencephalograms, and a user's relaxed degree will be presumed from the magnitude by electroencephalogram measurement. However, generally, when an eye is closed, compared with the case where the eye is opened, it is known that an alpha wave peak will become high and it is thought only at the peak of an alpha wave that a relaxed degree cannot be presumed. Moreover, since the effectiveness of a massage had been detected on abbreviation real time, though it was possible to have massaged on the high massage conditions of effectiveness more, about the concrete means for acquiring the optimal massage conditions, it was unstated, and there is no corroboration whose massage conditions acquired are optimal massage conditions, and, for this reason, the problem that where of massage actuation cannot be performed on the always optimal massage conditions had it.

[0006] Then, this invention offers the massage condition decision approach that the optimal massage conditions can be determined. Moreover, this invention offers the massage machine which determines the always optimal massage conditions and can perform massage actuation.

[0007]

[Means for Solving the Problem] Invention according to claim 1 evaluates the effectiveness of a massage to a user based on the evaluation information into which it was inputted by presumption from a user's physiology index and/, or the user, and is in the massage condition decision approach of performing the evaluation trial by the rectangular table which made the evaluation value this evaluated result, and determining the optimal massage conditions.

[0008] Invention according to claim 2 is set to the massage condition decision approach according to claim 1. Choose a part from two or more parameters which define an operating condition, perform the evaluation trial by the rectangular table



only using this selected parameter, and the optimal massage conditions are searched for. It is in determining the optimal massage conditions in which the parameter of the remainder by which post selection was not made is incorporated one by one, the evaluation trial by the rectangular table is repeated, and a line finally includes the whole.

[0009] Invention according to claim 3 evaluates the effectiveness of a massage to a user based on the evaluation information into which it was inputted by presumption and the user from a user's physiology index. While performing the evaluation trial by the rectangular table which made the evaluation value this evaluated result and determining the optimal massage conditions A difference with the evaluation value of the massage effectiveness evaluated based on the evaluation information inputted by the evaluation value and user of the massage effectiveness evaluated based on presumption from a user's physiology index is computed. When this difference is larger than a predetermined value, it is in the massage condition decision approach of redoing the part to which the evaluation trial by the rectangular table corresponds, and determining the optimal massage conditions again.

[0010] In claim 1 thru/or the massage condition decision approach of any 1 publication of 3, choosing suitably other massage conditions that a user can recognize the difference between the determined optimal massage condition and this massage condition has invention according to claim 4.

[0011] In the massage machine which has two or more parameters with which invention according to claim 5 defines an operating condition A massage effectiveness evaluation means to evaluate the effectiveness of a massage to the user at the time of using it based on the evaluation information into which it was inputted by presumption and/, or the user from a user's physiology index, It has a massage condition decision means to perform the evaluation trial by the rectangular table by making into an evaluation value the result which this massage effectiveness evaluation means evaluated, and to determine the optimal massage conditions, and is about massage actuation to the massage machine carry out at the massage conditions which the massage condition decision means determined.

[0012] Invention according to claim 6 establishes a selection means to choose a part of massage parameter, in a massage machine according to claim 5. A massage condition decision means 1st means to examine in the evaluation trial by the rectangular table only using the parameter chosen by the selection means, and to search for the optimal massage conditions, The 2nd means which has incorporated the remaining parameters which were not chosen one by one, and repeats the

evaluation trial by the rectangular table is established, and it is in determining the optimal massage conditions which finally include the whole.

[0013] In the massage machine which has two or more parameters with which invention according to claim 7 defines an operating condition A message effectiveness evaluation means to evaluate the effectiveness of a message to the user at the time of using it based on the evaluation information into which it was inputted by presumption and the user from a user's physiology index, A message condition decision means to perform the evaluation trial by the rectangular table by making into an evaluation value the result which this message effectiveness evaluation means evaluated, and to determine the optimal massage conditions, It has a physiology mental comparison means to compute a difference with the evaluation value of the message effectiveness evaluated based on the evaluation information inputted by the evaluation value and user of the message effectiveness evaluated based on presumption from a user's physiology index. When the difference which the physiology mental comparison means computed is larger than a predetermined value, a message condition decision means is in the massage machine which performs message actuation on the optimal massage conditions which redid the part to which the evaluation trial by the rectangular table corresponds, determined the optimal massage conditions again, and were finally determined.

[0014] In claim 5 thru/or the massage machine of any 1 publication of 7, while the message condition decision means is performing the evaluation trial by the rectangular table, having established a guidance means to tell a user about an experimental advance situation has invention according to claim 8.

[0015] In claim 5 thru/or the massage machine of any 1 publication of 8, invention according to claim 9 establishes a storage means to memorize the optimal massage conditions which the message condition decision means determined, and is to perform message actuation on the optimal massage conditions memorized for this storage means.

[0016]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing. Drawing 1 is drawing showing the configuration of the whole massage machine. 1 A massage chair, An actuation machine for a user 2 to operate the massage chair 2, as for the user who 2 sits on this massage chair 1, and receives a massage, and 3, The Ag-AgCl electrode for equipping a user's 2 head with 4 and performing electroencephalogram measurement, The signal-processing section which 5 incorporates a signal from this Ag-AgCl electrode 4, and performs

predetermined processing, and 6 are computers which carry out drive control of said massage chair 1 based on the information from this signal-processing section 5, and the information from said actuation machine 3.

[0017] Said massage chair 1 shrunk the air bag, performs massage actuation, adjusted strength according to an air bag's swelling, and is equipped with the function of the pulse operation to which the speed which swells an air bag is changed intermittently. Moreover, said massage chair 1 can massage seven parts, a neck/shoulder, the back, the back, the waist, the hips, a peach, and a foot, and only the foot is equipped with the function of the foot coincidence which can be operated even while other parts are operating.

[0018] The parameter which determines the operating condition of said massage chair 1 has four, a pulse, a part, and foot coincidence, in strength, and massage actuation is performed by these four parameter combination. In addition, there is a three-stage of weakness in strength into strength, there is a three-stage of nothing, \*\*, and \*\* in a pulse, there are six kinds, a neck/shoulder, the back, the back, the waist, the hips, and a peach, in a part, and there is a three-stage of weakness and nothing in foot coincidence strength.

[0019] Moreover, these operating conditions can be inputted now from said actuation machine 3. Said actuation machine 3 is equipped with the recommendation course selection carbon button which can choose the recommendation course in which change a parameter suitably for about 15 minutes, and massage actuation is performed automatically.

[0020] This massage machine the parameter which determines these operating conditions A factor, Effectiveness of a massage of having presumed the condition of each parameter from the physiology index by the signal from the evaluation result and said Ag-AgCl electrode 4 of effectiveness of the massage by a user's subjectivity into which it is inputted from a level and said control unit 3 is made into an evaluation value. The massage conditions optimal for the user 2 of the massage chair 1 are opted for the trial according to the rectangular table used with an experimental design etc., i.e., the trial which actually massages and investigates the effectiveness, by a multiple-times deed and the small count of trial.

[0021] In addition, as a physiology index measured in the engineering field, although there are an electroencephalogram, an electrodermal activity, blood pressure, a heartbeat, breathing, a pulse wave, etc., for catching change of feeling and feeling of human being called the massage effectiveness, it is direct to investigate a cerebral condition, it is clear, and is using the electroencephalogram here.

[0022] Said Ag-AgCl electrode 4 measures a user's 2 electroencephalogram, as wearing becomes easy, it consists of a band-for-hair-like member, the head containing a frame is equipped with this member, and the electroencephalogram of the user 2 who is performing massage actuation is detected.

[0023] Although the unipolar induction which detects a difference with reference electrodes, such as an earlobe, is sufficient as derivation of an electroencephalogram, he is trying to detect it by the bipolar lead here. In addition, with hyperbolic induction, it is the electroencephalograph of one channel of the regio-frontalis-capitis bipolar derivation of frame criteria, and bipolar derivation detects miniature potential with the electrode 4 with which the regio frontalis capitis was equipped as indicated by JP,10-262942,A.

[0024] Said signal-processing section 5 transmits to said computer 6 by using wave information on an electroencephalogram as digital data, after amplifying and carrying out A/D conversion of the electroencephalogram measured with said Ag-AgCl electrode 4. Here, it is made to perform an exchange of the data from said signal-processing section 5 to a computer 6 using cables, such as RS232C. In addition, the radio system using an electric wave, infrared radiation, etc. can also perform an exchange of this data. When radio system is used, the user 2 of the massage chair 1 can equip holding the signal-processing section 5, a belt, etc., it can move about freely by this, and a user's 2 burden in electroencephalogram measurement can be mitigated.

[0025] Said computer 6 is equipped with a massage effectiveness evaluation means to change evaluation of the massage effectiveness to this user 2 into a numeric value from a user's 2 electroencephalogram, and a massage condition decision means to determine the optimal massage conditions based on the result which this massage effectiveness evaluation means evaluated. In addition, in order to evaluate a massage, a massage condition decision means to determine a massage effectiveness evaluation means to change into a numeric value from an electroencephalogram, and the optimal massage conditions may be built in the massage chair 1.

[0026] Drawing 2 is the block diagram showing the configuration of a massage machine. 11 is a numerical conversion means and this numerical conversion means 11 constitutes the massage effectiveness evaluation means. 12 is a massage condition decision means and the parameter setup means 13, the test plan means 14, the condition decision means 15, and the data storage means 16 constitute this massage condition decision means 12. 17 is a massage chair actuation means and this massage chair actuation means 17 actually operates said massage chair 1 according to the massage conditions given from said test plan means 14 and the data storage means 16.

In addition, massage conditions are four parameter combination of (the three-stage of strength, inside, and weakness), a pulse (three-stage of nothing, \*\*, and \*\*), and foot coincidence (three-stage of nothing, weakness, and strength) in the part (six places of a neck / shoulder, the back, the back, the waist, the hips, and a peach) and strength which massage.

[0027] Said control unit 3 has various kinds of manual operation buttons, and when inputting subjectivity evaluation of the case where it is set up which parameter a user 2 uses by the evaluation trial by the rectangular table, or a massage, it is used.

[0028] Said parameter setup means 13 is equipped with the function to set up which parameter is used by the evaluation trial by the rectangular table. That is, a setup which chooses the parameter and level of the setup and part which examine combining each parameters of all, and performs the evaluation trial by the rectangular table only for the selected thing is performed.

[0029] Said test plan means 14 makes an evaluation test plan using the condition of a pulse and foot coincidence in the massage part and strength which were set up with said parameter setup means 13, and determines the count of evaluation of said massage chair 1.

[0030] Among the parameters of massage conditions, although three, a pulse and foot coincidence, have three levels in strength, respectively, about the part which decides which part of the body to massage, there are 6 conditions of a neck/shoulder, the back, the back, the waist, the hips, and a peach, and it becomes six levels.

[0031] In addition, although it is also possible to use and evaluate rectangular tables with many counts of trial, such as L27 rectangular-cross table, when there is a parameter of six levels, it it repeats not much many evaluation trials, a habituation arises to a user and exact evaluation becomes impossible [ user ]. Then, if L9 rectangular-cross table in a design of experiment since three levels, then the count of massage trial are the combination of 4 factor 3 level, as chosen only three of six conditions also about a part, and shown in drawing 3 is used, evaluation can be performed by nine evaluation trials. In addition, when evaluating all combination without using a rectangular table, an evaluation trial must be performed 81 times by 3x3x3x3.

[0032] Evaluation of the massage which said numerical conversion means 11 performs performs the evaluation and subjectivity evaluation by the physiology index for every one evaluation trial. The calculation approach of a physiology index uses the satisfaction level obtained by satisfaction instrumentation system which is indicated by JP,10-262942,A. This satisfaction instrumentation system is a system which

measures human being's satisfaction using the neural network who considered the electroencephalogram as the input.

[0033] A neural network learns by the error back propagation method by 3 layer structures which consist of an input layer, an interlayer, and an output layer. That is, a neural network evaluates satisfaction by the questionnaire from many sides in two or more feeling words, chooses the sample the satisfaction condition and the dissatisfied condition were judged to be based on this evaluation, and learns the power spectrum of the electroencephalogram in each sample as an input signal.

[0034] In a neural network, a satisfaction level takes the value of 0-1, and it is judged that it is satisfied, so that it is close to 1. Moreover, although analysis time amount of a satisfaction level is made into 8.53 seconds or 4.27 seconds in a gazette, it cannot be estimated that the effectiveness of a massage does not repeat the to some extent same stimulus.

[0035] What is necessary is to perform analysis for 8.53 seconds 10 times, and just to let the average value be the evaluation result of the massage conditions concerned there. As for the whole evaluation trial, it is desirable to finish with about 15 minutes when neither a user's habituation nor weariness can take place easily. When the above-mentioned L9 rectangular-cross table is used, about 100 seconds is suitable for the averaging time of each massage conditions. That is, it is appropriate to take about 20 times of the averages in the analysis for about 10 times and 4.27 seconds in the analysis for 8.53 seconds.

[0036] Moreover, subjectivity evaluation inputs feeling merit when the user 2 is trying the massage from a control unit 3 numerically. The numeric value at this time should just make the condition which does not have the massage effectiveness in 0, and 100 the condition that the massage effectiveness is the highest, with the value of 0-100. In addition, either [ even ] a physiology index or the subjectivity evaluation of evaluation of a massage is good also as a chisel.

[0037] Although the user of the massage chair 1 itself may input about which condition of each parameter the evaluation trial by the rectangular table is performed as mentioned above using a control unit 3 and you may determine, it is possible to perform, even if it does not perform this input.

[0038] Drawing 5 is a flow chart which shows decision processing of massage conditions when a user 2 does not determine the part massaged first. First, although three are chosen from a setup of a part, i.e., six conditions, at step S1, three parts, a neck/shoulder, the back, and the back, choose these three parts here as what is set up beforehand. Next, a test plan table is created at step S2 using the parameter of

these three parts. For example, if A, B, C, and D of L9 rectangular-cross table of drawing 3 are made into a pulse and foot coincidence in a massage part and strength, a trial schedule as shown in drawing 4 will be created.

[0039] And at step S3, an evaluation trial is performed and a satisfaction level is measured. That is, as shown in drawing 4 R> 4, the 1st trial makes [ A (part) ] D (foot coincidence) nothing for a neck/shoulder, and B (strength) by making C (pulse) into nothing strength, and performs an evaluation trial. And an electroencephalogram is measured with the Ag-AgCl electrode 4, data are sent to a computer 6 through the signal-processing section 5, and a satisfaction level is computed by the satisfaction instrumentation system.

[0040] Then, the user 2 who is sitting on the massage chair 1 in step S4 inputs a subjectivity evaluation result using a control unit 3. And the satisfaction level and subjectivity evaluation result which were computed at step S5 are memorized in the memory within a condition decision means.

[0041] Then, it is confirmed whether the trial was performed 9 times at step S6. Since it is the 1st time, it returns to step S1 and the 2nd trial is still performed. As shown in drawing 4, the 2nd trial makes [ A (part) ] D (foot coincidence) weakness for the back and B (strength) by making C (pulse) into \*\* inside, and performs an evaluation trial.

[0042] In this way, the evaluation trials from No.1 to No.9 are performed in the combination of the massage conditions shown in drawing 4, and the satisfaction level and the subjectivity evaluation result of having repeated and computed calculation of a satisfaction level and the input of a subjectivity evaluation result, respectively are memorized in the memory within the condition decision means 15.

[0043] Thus, after a trial schedule is created, an actual evaluation trial tells massage conditions to said massage chair actuation means 17 for every line crack and one evaluation trial 9 times, operates the massage chair 1, and measures an electroencephalogram with a satisfaction instrumentation system from the user 2 sitting on the massage chair 1.

[0044] And whenever 1 time of massage conditions are completed, a satisfaction level is computed from a satisfaction level instrumentation system, and whenever one trial is completed by the user, a subjectivity evaluation result will be inputted from a control unit 3, and a satisfaction level and a subjectivity evaluation result will be memorized by the memory within the condition decision means 15.

[0045] After nine evaluation trials are completed, the condition decision means 15 determines the massage conditions considered to be the optimal from the subjectivity evaluation by all trial, and a satisfaction level at step S7. The optimal massage

conditions are analyzed and determined for every parameter according to evaluation criteria.

[0046] The decision of the optimal message conditions is made in the following procedures. First, it asks for the average  $m$  and standard deviation  $\sigma$  from three data corresponding to each level. For example, when the evaluation criteria  $E$  of drawing 3 are made into a satisfaction level and evaluation criteria  $F$  make it subjectivity evaluation, about a parameter  $A1$ , the data of evaluation criteria  $E$  are  $x1$ ,  $x2$ , and  $x3$ . The average  $m$  and standard deviation  $\sigma$  are computed from  $x1$ ,  $x2$ , and  $x3$ .

[0047] Next, a system range  $SR$  is defined as follows using an average value  $m$  and a standard deviation  $\sigma$ .

$SR = m + k\sigma$  — (1), however Constant  $k$  are taken as a safety factor.

[0048] Moreover, a design range  $DR$  is set up. Since a design range is the range of the evaluation value which can permit the system concerned, or the range of wanting the engine performance to become like this and is the effectiveness of a message here, it has been set as the range of a value higher than a certain level. And the place with which a design range  $DR$  and a system range  $SR$  lapped is defined as a common range  $CR$ . The functional error  $D$  is defined as follows from this system range  $SR$  and a common range  $CR$ .

[0049]

[Equation 1]

[0050] It is shown how much the range where data vary has separated this functional error  $D$  from a design range  $DR$ . Thus, the functional error  $D$  over a parameter  $A1$  is searched for, other evaluation criteria  $F$ , i.e., subjectivity evaluation result, and they are totaled. When  $D_e$ ,  $D_f$ , and the total functional error are made into the total functional error  $D_t$  for evaluation criteria  $E$  and the functional error  $F$  Receiving, respectively, the total functional error  $D_t$  is  $D_t = D_e + D_f$ . — It is set to (3). This total functional error  $D_t$  is computed at step S8.

[0051] About the total functional error  $D_t$ , it asks also about a parameter  $A2$  and  $A3$ , and let  $A1$ ,  $A2$ , and the smallest value in  $A3$  be optimum values. An optimum value is similarly calculated for this about Parameters  $B$ ,  $C$ , and  $D$ . Temporarily, supposing  $A1$ ,  $B-2$ , and  $C1$  and  $D3$  take an optimum value, this combination will serve as message conditions once optimal for a user 2 in the evaluation trial of an eye performed by



choosing three conditions from the part whose number is six. In this way, the optimal message conditions are determined in step S9. In addition, the value of the total functional error  $D_t$  computed at this time is memorized by the data storage means 16. [0052] If the optimal message conditions are decided by step S9, it will be confirmed whether there is any message part which has not been tried yet about Parameter A at step S10. And if there is a message part which has not been tried yet, the message part which makes few message parts of a functional error the new parameter A1, returns to step S1, and has not been tried yet at step S11 will be set up, and same processing will be performed. Namely, what is necessary is just to create test plan tables including the message part which became the optimal by the evaluation carried out previously by the evaluation trial of the 2nd henceforth.

[0053] In this way, the evaluation trial using L9 rectangular-cross table of the 2nd henceforth is similarly performed about the message part which has not been tried yet, finally the high message conditions of the message effectiveness to a user are most determined in all conditions, and this is memorized for the data storage means 16 at step S12. That is, the total functional error of the part made the optimal by the previous trial and the newly tried part is compared, and what has the smallest functional error is made the optimal. In the last trial experiment, it is repeatedly determined that the small things of the total functional error  $D_t$  are the optimal message conditions until the message part which is not trying this is lost.

[0054] In addition, in creating a test plan table without including the part made the optimal, in trial of the first evaluation trial and an evaluation trial of the 2nd henceforth, it asks for the respectively temporary optimal part, new test plans including this called-for temporary optimal part are performed, and it determines the optimal thing among total combination. Moreover, evaluation with more suitable having opened and performing fixed time amount, such as carrying out on the next day, when a habituation and weariness of a user become a problem can perform the evaluation trial of the 2nd henceforth, and it becomes possible to find out the more certainly optimal message conditions.

[0055] Although all the message parts were tried and message conditions were determined in the processing of drawing 5 mentioned above, it can also try, after a user chooses a message part beforehand. Drawing 6 is a flow chart which shows decision processing of the message conditions when choosing the part which a user 2 messages first.

[0056] First, a part is set up at step S21. Here, the part where a user 2 wants to message is chosen, and three out of six conditions are inputted. Next, a test plan table

is created at step S22 using the parameter of these three parts. This creates the design of experiment table by L9 rectangular-cross table like step S2 of drawing 5 mentioned above. And at step S23, an evaluation trial is performed and a satisfaction level is measured. This is the same as that of step S3 of drawing 5 .

[0057] It is the same as that of step S4 of drawing 5 which also mentioned these above at the judgment of a count, and step 27 by storage processing and step S26 in a subjectivity evaluation input and step S25 although the total functional error was computed at calculation of the optimum value of a parameter, and step S28 and message conditions were determined one by one at step S29 – S9 at the following and step S24. And at step S30, \*\*\*\*\* memorizes message conditions as they are, and ends message conditions.

[0058] Thus, choosing the part massaged beforehand does not need to massage the part which does not want to massage, and it can perform the optimal massage by the small count of trial of 9 times.

[0059] In addition, although message evaluation was performed here using both the satisfaction level presumed from the physiology index (electroencephalogram), and subjectivity evaluation, it can also carry out only using either. In A1, one functional error is calculated and the functional error at this time should just take an optimum value from a thing with this low value.

[0060] Moreover, when it becomes clear about what has an extremely low value when trying, you may make it eliminate, although here explained the case where the optimal message conditions were determined after trying all the combination in a rectangular table.

[0061] For example, when x1 of a satisfaction level E, x2, and a value with the value of x3 near 0 are taken the result of the trial A1 of the 2 or 3rd trial A1, B-2, C2, and D of the 1st trial A1, B1, C1, and D, B3, C3, and D3, [ 1 or 2nd ] It enables the direction which stopped the trial experiment before searching for a functional error for the conditioning of A1, chose another condition with the parameter concerned, and was again redone from formulation of a test plan to find out the optimal message conditions by the small count of trial.

[0062] Moreover, with the parameter which determines message conditions, if a part changes, for example, the evaluation result of the effectiveness of a message changes greatly, but even if strength changes, the weight of a parameter, i.e., the method of change of an evaluation result, may change with conditions of those who use [ change / an evaluation result / seldom ] it, or its man etc. In such a case, it considers as the object of an optimization trial of only a part with heavy weight among parameters, and

other parameters can also decide on random.

[0063] Moreover, in the case of the example of drawing 4 , it is necessary to perform nine evaluations in the trial according to a rectangular table. However, when evaluating a massage, also at the lowest, about 1 – 2 minutes is taken not much for effectiveness not to show up and to evaluate one massage condition for a short time.

[0064] Therefore, the time amount for about ten minutes is needed for carrying all out 9 times. In the meantime, if a user 2 cannot grasp to which phase the evaluation trial is going, he may become uneasy. This anxiety laps with the massage effectiveness and affects subjectivity evaluation and a physiology index.

[0065] Then, in order to remove these sources of anxiety, it is still more effective, if voice etc. is used and an advance situation is told to a user. What is necessary is just to specifically pass the guidance voice of “evaluating eye OO time next”, before one trial starts.

[0066] Moreover, the determined massage conditions are memorized by the data storage means 16. Therefore, when the same user as a degree receives a massage, even if it does not perform an evaluation trial for the decision of optimization, the optimal massage conditions can be read from the data storage means 16, and the optimal massage can be received immediately.

[0067] Storage of the optimal massage conditions to the data storage means 16 is not what was restricted to one person, and should just memorize about two or more users of all that performed the evaluation trial by the rectangular table. And two or more users can receive now the massage respectively optimal for self from the data storage means 16 immediately because a user forms the means which reads the optimal massage conditions applicable to itself in the massage chair 1.

[0068] The means which reads the optimal massage conditions which correspond using the personal-authentication system of common knowledge, such as a means which reads the optimal massage conditions which correspond in a user inputting a user number as a means which reads the optimal massage conditions applicable to itself using the carbon button prepared in the control unit 3, for example from the data-storage means 16, and fingerprint recognition, speech recognition, is realizable.

[0069] Moreover, since massage conditions are memorized, it becomes unnecessary to do the same activity, when massaging using the massage chair 1 after determining the optimal massage conditions, but when low back pain and stiffness in shoulder are becoming lighter than before according to a bodily condition, it is also possible to acquire the massage conditions which suited the condition at that time by examining again.

[0070] In addition, although it was made to repeat only the optimal massage conditions in an evaluation trial with the gestalt of this operation, if only the massage conditions optimal in this way are repeated, a user may get bored gradually and the massage effectiveness may become low.

[0071] In order to cancel this, approaches, such as repeating by turns, combining massage conditions other than the optimal massage condition and its massage condition, are effective. Although what kind of massage conditions are sufficient as long as other massage conditions combined with the optimal massage conditions do not have the not much low evaluation value of the massage effectiveness, the massage conditions a user can recognize the differences from the optimal massage conditions to be are desirable.

[0072] For example, if massage conditions are determined as follows, it is effective for prevention of weariness and a habituation. It asks for standard deviation sigmap of the total functional error Dt for every parameter. For example, if a parameter is (B) in strength, standard deviation sigmap of the total functional error DtB2 of (B-2) and the total functional error DtB3 of weakness (B3) will be computed inside with the total functional error DtB1 of strength (B1). Since Dt is a numeric value corresponding to the evaluation result of a massage, it means how many effects the standard deviation has on the evaluation result of a massage of the parameter concerned. namely,, so that standard deviation is large -- effect -- a large -- \*\* -- \*\* when in other words standard deviation sigmap is a small parameter, since for example, parameter strength has the strong user, it may be alike and he may not notice things which the condition changed, such as a weak unusual thing. Then, standard-deviation sigmap changes only the condition of the largest parameter, and should just consider as massage conditions.

[0073] Moreover, although the gestalt of this operation explains the case where both subjectivity evaluation results which are the result of expressing numerically the result which the value and the user itself of a satisfaction level who presumed from the physiology index (electroencephalogram) evaluated subjectively are used for evaluation of the effectiveness of a massage, the difference of these two evaluation results may be big. This is considered that the noise at the time of electroencephalogram measurement etc. has influenced. In such a case, what is necessary is just to redo an evaluation trial again.

[0074] What is necessary is to compute a difference, whenever it prepares an evaluation result comparator in a massage condition decision means and one evaluation finishes, and just to specifically measure again the massage effectiveness

by the message conditions of this \*\*, when it becomes beyond the limit which the difference set up beforehand. In this case, the value of a satisfaction level should just compute by a difference doubling a satisfaction level 100, when the range of the value of 0 to 1 and a subjectivity evaluation result is 0-100. In addition, carrying out to about 30 is appropriate for the limit value of a difference.

[0075] Moreover, when the message condition optimization approach explained above is enforced to two or more users in the phase of development of a message machine, as for most users, "\*\*" may become the optimal [ a specific parameter / the same level ] about a large majority of users -- "foot coincidence" becomes the optimal. In such a case, if it examines by drawing up a test plan only about the other parameter without fixing the set point of the parameter of this \*\* to the level made the optimal (it fixes to those with foot coincidence in a previous example), and removing from the object of optimization, namely, including in a test plan, it is possible to determine the optimal message conditions by the smaller count of trial.

[0076] In addition, although the air bag-type message machine was explained to the example in the gestalt of this operation, this invention is not what was restricted to this, is rubbed and can be applied to other message machines, such as a ball type.

[0077]

[Effect of the Invention] As explained in full detail above, according to invention according to claim 1 to 4, the message condition decision approach that the optimal message conditions can be determined can be offered. Moreover, according to invention according to claim 2, a part of parameter is chosen further, the evaluation trial by the rectangular table is performed, and since the message conditions optimal within the selected condition were searched for, the parameter of the remainder by which post selection was not made is incorporated one by one and he is trying to repeat the evaluation trial by the rectangular table, the message condition decision approach which can be determined in the optimal message conditions at the small count of trial can provide.

[0078] Moreover, since according to invention according to claim 3 the evaluation trial by the rectangular table is redone and the optimal message conditions are determined when the difference of the evaluation result of the message effectiveness presumed from a user's physiology index and the message effectiveness by a user's subjectivity is still larger, the message condition decision approach that the optimal message conditions can be determined can be offered, without being influenced of a noise etc.

[0079] Moreover, since according to invention according to claim 4 other message conditions that a user could recognize the difference from this message condition

were included in the determined optimal massage conditions and massage conditions are further determined as them, the massage condition decision approach that the massage conditions which can prevent weariness by receiving one massage condition continuously can be determined can be offered.

[0080] Moreover, according to invention according to claim 5 to 9, the massage machine which determines the always optimal massage conditions and can perform massage actuation can be offered. Moreover, according to invention according to claim 6, a part of parameter is chosen further, the evaluation trial by the rectangular table is performed, and since the massage conditions optimal within the selected condition were searched for, the parameter of the remainder by which post selection was not made is incorporated one by one and he is trying to repeat the evaluation trial by the rectangular table, the massage machine which can be determined in the optimal massage conditions at the small count of trial can be provided.

[0081] Moreover, since according to invention according to claim 7 the evaluation trial by the rectangular table is redone and the optimal massage conditions are determined when the difference of the evaluation result of the massage effectiveness presumed from a user's physiology index and the massage effectiveness by a user's subjectivity is still larger, the massage machine which can determine the optimal massage conditions can be offered, without being influenced of a noise etc.

[0082] Moreover, according to invention according to claim 8, further, since he is trying for the advance situation of a trial during the evaluation trial by the rectangular table to tell a user, the massage machine which can prevent that a user cares about an advance situation and the estimate of the comfort by electroencephalogram measurement becomes uncertain can be offered.

[0083] Moreover, since according to invention according to claim 9 the determined optimal massage conditions are memorized further and it is made to perform massage actuation on this memorized optimal massage condition, there is no need of performing the evaluation trial by the rectangular table each time, and the massage machine which can perform massage actuation on the optimal massage conditions easily can be provided.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] Drawing showing the configuration of the whole massage machine concerning the gestalt of operation of this invention.

[Drawing 2] The block diagram showing the configuration of the massage machine in the gestalt of this operation.

[Drawing 3] Drawing showing the general configuration of L9 rectangular-cross table used with the gestalt of this operation.

[Drawing 4] Drawing showing the concrete configuration of L9 rectangular-cross table used with the gestalt of this operation.

[Drawing 5] The flow chart which shows decision processing of the massage conditions at the time of not determining the part massaged to the beginning in the gestalt of this operation.

[Drawing 6] The flow chart which shows decision processing of the massage conditions when choosing the part massaged to the beginning in the gestalt of this operation.

[Description of Notations]

1 -- Massage chair

3 -- Control unit

4 -- Ag-AgCl electrode

5 -- Signal-processing section

6 -- Computer

11 -- Numerical conversion means

12 -- Massage condition decision means

13 -- Parameter setup means

14 -- Test plan means

15 -- Condition decision means

16 -- Data storage means

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